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ABSTRACT

Paivio's Dual Coding Theory has received widespread recognition for its connection between visual and aural channels of internal information processing. The use of only two channels, however, cannot satisfactorily explain the effects witnessed every day. This paper presents a study suggesting the presence a third, kinesthetic channel, currently used by Neurolinguistic Programming (NLP) practitioners. According to the concept of NLP, a person facing a stimulus has a reaction which results from their past experience, their understanding, and their training; these associations control their actions and behaviors, at both the voluntary and involuntary levels. In this project, information on how subjects were processing information was drawn using the NLP calibration techniques of eye accessing, breathing, and skin color. These were correlated with the way the stimuli were presented, the subject's choses processing modality, gender, level of education, and age. Subjects in the first part were 25 people ranging in age from 16 to 53; in the second part, subjects were 11 people ranging in age from 5 to 16. Each subject participated in a screening interview and was then asked to (1) listen to a 4-minute audio recording of a transcribed radio drama, and (2) participate in a 3-minute dialogue with two confederates who were working from a script designed to actively involve the subject emotionally. The best indication that comes from the results is support for the idea that people use three modalities of information processing, which supports the contentions of NLP practitioners that we are creatures of our emotions and feelings as much as of our words and visual images when it comes to the internal processing of information. (Contains 15 references.) (AEF)

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Tri-Coding Of Information

by Timothy J. Simpson

Abstract

Paivio's (1979, 1986) Dual Coding Theory has received widespread recognition for its connection between visual and aural channels of internal information processing. The use of only two channels, however, cannot satisfactorily explain the effects witnessed everyday. This paper presents a study suggesting the presence of a third, kinesthetic channel, currently used by NLP practitioners, which operates in cooperation with the channels of Paivio's theory and expands its usefulness.

Paivio (1979, 1986) presented a theoretical construct which he called dual coding to explain the manner in which people process and make sense out of the information with which they come into contact. According to this construct, dual coding comes about as a result both of the aural and visual nature of the way the human brain processes information. Sense of each modality is made from their own representational system within the mind and experience of the individual. Information bits accessed in the internal visual channel are called imagens, while information bits accessed in the internal aural channel are called logogens. They come into contact with each other within the consciousness of the individual, and they each alter the meaning assigned to the other in the process because of their associations from within a person's memory and experience.

During the 1980's and 1990's there have been several attempts made to validate Paivio's construct (*e.g.*, Dean & Gray, 1985; Kulhavy *et al*, 1993; Mayer & Sims, 1994; Kounios & Holcomb, 1994; Sadoski, Goetz & Avila, 1995). Each of these studies examined the connection between verbal and visual information presented to subjects. Each concluded that the concept of dual coding of information explained their results. In addition, Dean and Gray's (1985) conclusions were based upon the connection they perceived between the hemispheric nature of the human brain and the conceptualization from the dual coding hypothesis. Most also concerned abstract and concrete nature of stimuli, which Paivio (1986) also predicted.

In each case, these studies restricted themselves to the two internal processing channels which Paivio (1979) had hypothesized. From practical experience, however, Paivio's construct falls short. People aren't restricted to mentally processing information verbally or visually solely. There seems to be another influence present. The history of music has provided several examples of compositions which influence people profoundly even today. The feelings do not come merely from the sound but also from the feelings which listeners have for their associations with these sounds. In recent times, broadcast commercials have attempted to elicit emotional responses from their audiences to purchase products or services they might not otherwise purchase. Public service announcements seek to influence their audiences to change the *status quo*, to make decisions differently, to act in a manner consistent with their presentations rather than in the manner in which people might be expected to otherwise react. These examples suggest that there is another internal channel of information processing which also has an effect on altering the meaning of verbal and/or visual stimuli.

Paivio's construct came out of a tradition of research which required an emotional

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detachment of the researcher from the subject under study (*e.g.* Gay, 1996; Kerlinger, 1964). This detachment has a purpose: to prevent an emotional bias on the part of the researcher from unduly influencing the results of that research. While this is indeed a desirable goal, the way it has been met has itself biased the research conducted in information processing, as an impediment to an impartial consideration of Paivio's construct.

In an attempt to meet the goals of research methodology regarding reduction of bias while addressing the need for examination of an emotional influence, this project sought a different paradigm. This paradigm needed to accept the presence of emotions, feelings, and so on, from the subject while having a way of identifying the influence which these feelings would have over the results of the study, maintaining other methodological considerations. The technique chosen was one developed in 1975 using Neurolinguistic Programming (NLP).

NLP was developed by Bandler and Grinder (1975) from basic concepts in classical conditioning. According to the concept of NLP, a person facing a stimulus has a reaction which results from their past experience, their understanding, and their training. These associations control their actions and behaviors, at both the voluntary and involuntary levels. By examining the changes in involuntary reactions an individual presents, an investigator can draw conclusions as to how an individual is internally processing the information, how it is influencing that individual by sparking an internal change, and so on. NLP has had its greatest impact on the field of counseling, giving a counselor or therapist clues as to changes in internal state, crisis points in change patterns, and so on. Changes important in treatment of phobias and other therapeutic techniques owe much of their success to the information these techniques can give a trained professional.

The techniques of NLP have been used in counseling because it allows a trained counselor to access information about a client of which the client may be unconsciously aware and unable to verbally express. By examining changes in a person's breathing rate and pattern, skin color, eye movements, and so on, a counselor can determine unconscious feelings, attitudes, and so on, which would impact a person's performance (Charvet, 1993). Using NLP techniques in other fields has been suggested as well. Classroom learning (Simpson, 1994; Nagel *et al*, 1993), sales (Reese & Bagley, 1987), and personal development (Robbins, 1992) have most notably utilized these NLP techniques.

In this project, information on how subjects were processing information was drawn using the NLP calibration techniques of eye accessing, breathing, and skin color. These were correlated with the way the stimuli were presented, the subject's primary (or chosen) processing modality, gender of subject, level of education, and age (development).

Method

Subjects in first part were 25 people (14 male, 11 female) ranging in age from 16 to 53. All were high school graduates, with over half holding college degrees, three of these graduate degrees. All were volunteers from three social groups who participated individually at a time of their convenience during the early months of 1996. None was selected on the basis of any other characteristics.

In the second part, subjects were 11 people (4 male, 7 female) ranging in age from 5 to 16. All volunteers participated individually. They were enrolled in a summer program in Broward County Florida during the middle of 1996. All were public or private school students K-12. Each provided consent from one of their parents prior to participating in the study. None was selected on the basis of any other characteristics.

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Each subject first participated in a screening interview. At this time, subjects were asked questions which prompted them to internally process data aurally, visually, or kinesthetically to establish their personal preference of internal information processing modality. (This is not controlled by the modality of the stimulus. Rather it is a preference as to how the brain internally processes information presented to it, regardless of the sensory modality used in information acquisition.) All subjects were then asked a series of six questions which prompted each of them to process information using each of the three identified modalities (aural, visual or kinesthetic). The eye accessing, breathing, and skin coloring processing cues they presented in response to these questions were recorded. From this information, each subject was identified by preferred internal information processing style.

At the conclusion of this interview, each subject was asked to (1) listen to a four minute audio recording of a transcribed radio drama, and (2) participate in a three minute dialogue with two confederates who were working from a script designed to actively involve the subject emotionally by challenging their feelings on the topics of politics and religion. Each confederate was also trained to make the observations needed for the analysis of involuntary cues from the subjects. These were keyed to a common NLP calibration checklist and then correlated with the cues used in the calibration interview (eye accessing, breathing, and skin coloring).

At the conclusion of each study, a focus group composed of several of the subjects in each study was separately conducted. This was done to determine if subjective comments from the participants could help explain the observations. The focus group was conducted within one week of the members of the focus group' participation in the study.

Results

Of the 25 subjects in study 1, all but 3 (1 male and 2 female) appeared to show a strong preference for visual processing of information. Of the 11 subjects in study 2, 3 (1 male and 2 female) showed a preference for visual processing of information, 2 (1 male and 1 female) showed a preference for aural processing of information, and the remaining 6 (2 males and 4 females) showed a preference for kinesthetic processing of information. When faced with the audio tape and the conversation, each subject in study 1 processed information in more than one modality, although there primary modality was used more than any other. In study 2, the subjects were, for the most part, unable to change from their preferred processing modality. Gender of subject was not a significant factor, but age and educational background seemed connected together as a single contributing factor.

Discussion

Differences in age between the subjects in study 1 and study 2 show an interesting difference. The adults in study 1 were almost all primarily visual processors, but they were adept at processing information in each modality to a degree when called upon to do so. This seems to suggest that adults have an acquired ability to process in each modality, but they tend to process information in a combination of internal modalities as circumstances dictate. The juveniles in study 2, however, had a much broader range of preferred modalities. They tended to rely almost entirely on their preferred modality, regardless of the modality suggested by the stimulus. This would indicate that developmental stage (age) plays a role in the options one has available. As one ages, experience in using different modalities seems to offer the adult a choice, although the adults tended to use the options in combination with their preferred modality rather than use modalities with equal facility.

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Gender of subject appeared to play no part in determining internal processing preference or the ability to change modality as dictated by need. Although there are differences in number of males and females in each study, because of the small number of subjects involved there is no reason to assume gender is a factor.

Education of subjects, while probably a confounding influence with age, suggested that the academic training received in more extensive years of schooling trained the internal information processing capabilities of the subject. Those with more than a high school education were more able to move among the modalities and showed less of a dependence on their preferred modality (they combined the two less often than those whose education was limited to high school). However, since most of these subjects also had graduate school experience as well, lacking a group with undergraduate education, there is little reason to believe this is a continuous development.

The best indication that comes from the results is support for the idea that people use three, not just two, modalities of internal information processing. This supports the contentions of NLP practitioners that we are creatures of our emotions and feelings as much as of our words and visual images when it comes to the internal processing of information. With experience and practice, we develop an ability to utilize more than one modality effectively. We develop a preferred modality, and when there is no specific reason for choosing one modality over another this would seem to be the one we use. Those lacking experience and training (children in this study) develop one internal processing modality, which they seem to use in all situations and contexts. When that modality is not appropriate, they do not have another modality available to which they can switch. Consequently, they are limited in their ability to easily and smoothly assimilate information in comparison to adults.

During the course of this study, two additional observations were made which were not planned. First, children tolerated outside noises better than adults. One possible reason for this would be that the concentration required of them to process information effectively cuts off the influence of external competing stimuli. Adults, on the other hand, being more able to make adjustments in their processing of information, do this without conscious effort (an idea which was supported by spontaneous comments from several of the adult subjects after their participation). Those making this suggestion also stated that the external noise disturbed their concentration, but didn't necessarily prevent them from processing the information. The children in study 2, however, seemed to block out the noise. Many were asked about this after their participation, and they suggested that they have little difficulty concentrating on processing information, when they do concentrate.

The children in study 2 also offered that they have difficulty concentrating in areas where there are few external distractions. Many stated that they preferred the noise of a television or radio while thinking. Two of them stated that they do not use the library at school because they are unable to think in the quiet environment associated with a library. Instead, they prefer to study and think in an atmosphere which seems to bother adults.

Second, and of more importance here, each subject who was able to explain how they prefer to process information also suggested that the presence of other modality of stimuli tend to confuse them and make the information more difficult to process. For example, one woman who preferred visual internal processing stated that she had great difficulty listening to the words in conversations, but that if she pictured the images those words elicited in her mind she was able to process and retain most of the information in the conversation. Another

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woman, with an aural preference, said she had difficulty processing the words in a book unless she read the book internally to herself. Then she was able to process the information easily and retain it for later use.

Conjecture

With the suggestion by Dean & Gray (1985) that the hemispheric nature of the brain mirrors the concept of modalities presented in NLP, an interesting conclusion can be drawn. If NLP accurately describes the way we internally process information, then we do indeed make use of more than the two channels Paivio (1979, 1986) suggests. We use this capability without conscious control. While Paivio's hypothesis certainly seems accurate, it would seem the addition of another channel would be in order. A kinesthetic channel would explain how emotions and feelings attach to words and how each of us derives a unique personal meaning from events experienced in common with others.

This seems to hold true particularly in visual terms. The focus group of adults consistently commented on the importance of visual images to their ability to accurately and efficiently process information. If these visual images were lacking, the information tended to be jumbled and disjointed. If images could be associated later, many times the information could be retrieved and processed effectively.

The content of the visual images they created was also important. Strong emotional associations were common, which would explain the ability of propagandists to evoke emotions from people with visual images. Paivio's hypothesis, with the addition of a third (kinesthetic) channel, can effectively and efficiently explain this phenomenon. Its existence has been shown too many times throughout history, and the theme has been used extensively in literature (*e.g.*, Aldous Huxley's 1984). The alterations of meaning associated with visual images (imagens) and aural internal stimuli (logogens) and kinesthetic stimuli needs examination. Paivio has given us the concept to use. With a simple addition, we can begin to discover the mechanism by which we develop meaning from visual images.

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Table 1.
Information Processing Modalities Used by Subjects in Study 1

Modality	Radio Program	Conversation
Visual (Male)	14	12
Visual (Female)	11	9
Aural (Male)	10	11
Aural (Female)	10	9
Kinesthetic (Male)	11	9
Kinesthetic (Female)	11	11

n (males) = 14, n(females) = 11
Table shows modalities used during condition, not preferred modality.

Table 2.
Information Processing Modalities Used by Subjects in Study 2

Modality	Radio Program	Conversation
Visual (Male)	2	3
Visual (Female)	5	5
Aural (Male)	2	2
Aural (Female)	6	7
Kinesthetic (Male)	2	4
Kinesthetic (Female)	7	7

n (males) = 4, n(females) = 7
Table shows modalities used during condition, not preferred modality.

Table 3.
Percentage of Time Modalities Used by Subjects in Study 1

Modality	Radio Program	Conversation
Visual (Male)	42%	36%
Visual (Female)	36%	33%
Aural (Male)	37%	40%
Aural (Female)	37%	36%
Kinesthetic (Male)	21%	24%
Kinesthetic (Female)	27%	31%

n(males) = 14, n(females) = 11
Table shows percentage of modality use during condition, not preferred modality.

Table 4.
Percentage of Time Modality Used by Subjects in Study 2

Modality	Radio Program	Conversation
Visual (Male)	55%	59%
Visual (Female)	29%	24%
Aural (Male)	20%	25%
Aural (Female)	56%	59%
Kinesthetic (Male)	25%	16%
Kinesthetic (Female)	15%	17%

n(males) = 4, n(females) = 11
Table shows percentage of modality use during condition, not preferred modality.

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Table 5.
Other Modality Use Related to Preferred Modality, Study 1

	Visual	Aural	Kinesthetic
Visual (m)		11	12
Visual (f)		9	9
Aural (m)	0		0
Aural(f)	1		1
Kinesthetic(m)	1	0	
Kinesthetic(f)	1	0	

n(males) = 14, n(females) = 11
n(Visual - m = 13, f = 9), n(Aural - m = 0, f = 1), n(Kinesthetic - m = 1, f = 1)
Table indicates number of subjects using each non-preferred modality per preferred modality.

Table 6.
Other Modality Use Related to Preferred Modality, Study 2

	Visual	Aural	Kinesthetic
Visual (m)		0	0
Visual (f)		2	1
Aural (m)	1		0
Aural(f)	1		1
Kinesthetic(m)		1	0
Kinesthetic(f)		2	1

n(males) = 4, n(females) = 7
n(Visual - m = 1, f = 2), n(Aural - m = 1, f = 1), n(Kinesthetic - m = 2, f = 4)
Table indicates number of subjects using each non-preferred modality per preferred modality.